

Claims:

1. A method for low cost signature testing of electronic circuits produced by a manufacturing process subject to process variations and characterized by a selected set of performance parameters, comprising the steps of:
- constructing a model for predicting said performance parameters for a first electronic circuit produced by the manufacturing process as a result of receiving the output of one or more second electronic circuits produced by the manufacturing process and stimulated with a selected test stimulus;
- providing said output to said model;
- obtaining a prediction of said performance parameters by use of said model;
- measuring said performance parameters independently of said model; and
- iteratively varying said test stimulus to minimize the error between said prediction and the corresponding measured values for said performance parameters, for determining an optimized test stimulus.
2. The method of claim 1, further comprising constructing said model as a linear model.
3. The method of claim 2, further comprising revising said model for at least some of said iterations of said test stimulus.

4. The method of claim 1, further comprising constructing a non-linear model for predicting said performance parameters for a manufactured electronic circuit, including applying the optimized said test stimulus to one or more manufactured training circuits, obtaining respective signature outputs of said training circuits, measuring said performance parameters for said training circuits and relating said signature outputs to the measured said performance parameters for said training circuits.

5. The method of claim 4, further comprising applying the optimized said test stimulus to said manufactured circuit, obtaining a signature output thereof, applying said signature output of said manufactured circuit to said non-linear model, and obtaining a prediction of said performance parameters of said manufactured circuit by use of said model.

6. The method of claim 5, further comprising characterizing said signature outputs of said training circuits, characterizing said signature output of said manufactured circuit, comparing the results of said steps of characterizing with each other to determine a deviation therebetween, comparing said deviation to a predetermined threshold and, if said deviation is greater than said threshold, updating said non-linear model, including relating said signature outputs of said training circuits and said signature output of said manufacturing circuit to the measured said performance parameters for said training circuits and said manufacturing circuit.

7. The method of claim 4, further comprising providing performance specifications for said manufactured circuit, applying the optimized said test stimulus to said manufactured circuit, obtaining a signature output thereof, applying said signature output of said manufactured circuit to said non-linear model, and comparing said output with said performance specifications for determining whether said manufactured circuit fails to meet said performance specifications.

8. The method of claim 5, wherein said step of applying includes modulating an RF carrier with the optimized test stimulus, and wherein said step of

obtaining includes demodulating the output of said first electronic circuit by said RF carrier to obtain said signature output.

9. An apparatus for low cost signature testing of electronic circuits
5 produced by a manufacturing process subject to process variations and characterized by a selected set of performance parameters, comprising a computerized model for predicting said performance parameters for a first electronic circuit produced by the manufacturing process as a result of receiving the output of one or more second electronic circuits produced by the manufacturing process and stimulated with a
10 selected test stimulus, a device for iteratively varying said test stimulus, and a computer program adapted to command said device to iteratively vary said test stimulus so as to minimize the error between the performance parameters as predicted by said model and corresponding measured values for said performance parameters, for determining an optimized test stimulus.

15 10. The apparatus of claim 9, wherein said computerized model is a linear model.

20 11. The apparatus of claim 10, wherein said computer program is further adapted for revising said model for at least some of said iterations of said test stimulus.

25 12. The apparatus of claim 9, further comprising a computerized non-linear model for predicting said performance parameters for a manufactured electronic circuit, obtained by applying the optimized said test stimulus to one or more manufactured training circuits, obtaining respective signature outputs of said training circuits, measuring said performance parameters for said training circuits and relating said signature outputs to the measured said performance parameters for said training circuits.

30 13. The apparatus of claim 12, wherein said device is further adapted to apply the optimized said test stimulus to said manufactured circuit and obtain a

signature output thereof, wherein said computer program is adapted to receive said signature output, apply said signature output of said manufactured circuit to said computerized non-linear model, and obtain a prediction of said performance parameters of said manufactured circuit by use of said model.

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14. The apparatus of claim 13, wherein said computer program is further adapted for characterizing said signature outputs of said training circuits, characterizing said signature output of said manufactured circuit, comparing the results of said steps of characterizing with each other to determine a deviation therebetween, comparing said deviation to a predetermined threshold and, if said deviation is greater than said threshold, the apparatus further includes an updated computerized non-linear model for replacing said first computerized non-linear model obtained by steps including relating said signature outputs of said training circuits and said signature output of said manufacturing circuit to the measured said performance parameters for said training circuits and said manufacturing circuit.

15. The apparatus of claim 12, wherein said device is further adapted to apply the optimized said test stimulus to said manufactured circuit and obtain a signature output thereof, wherein said computer program is adapted to receive said signature output, apply said signature output to said computerized non-linear model, and compare said output with performance specifications for said manufactured circuit, for determining whether said manufactured circuit fails to meet said performance specifications.

16. The apparatus of claim 13, wherein said device is adapted for modulating an RF carrier with the optimized test stimulus and demodulating the output of said manufactured circuit by said RF carrier to obtain said signature output.

17. The apparatus of claim 16, wherein said device includes a low-pass filter for low-pass filtering the demodulated said output.